

Nuclear recoil simulation with GEANT4

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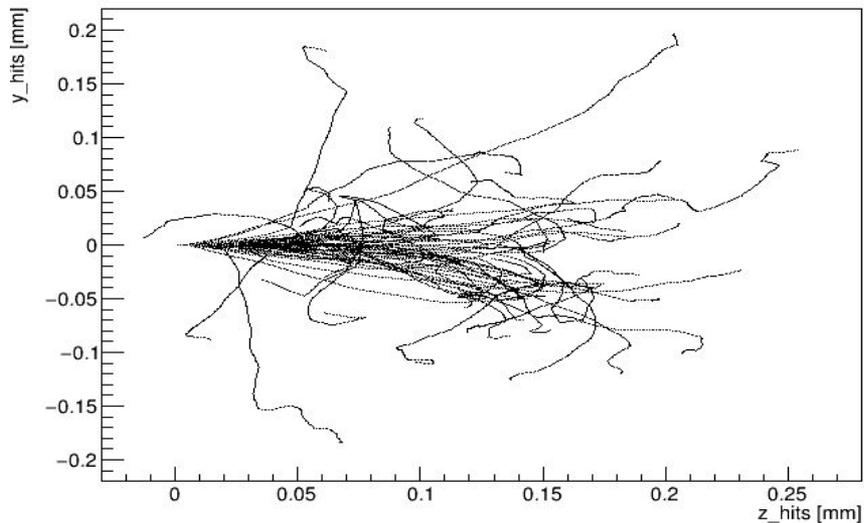
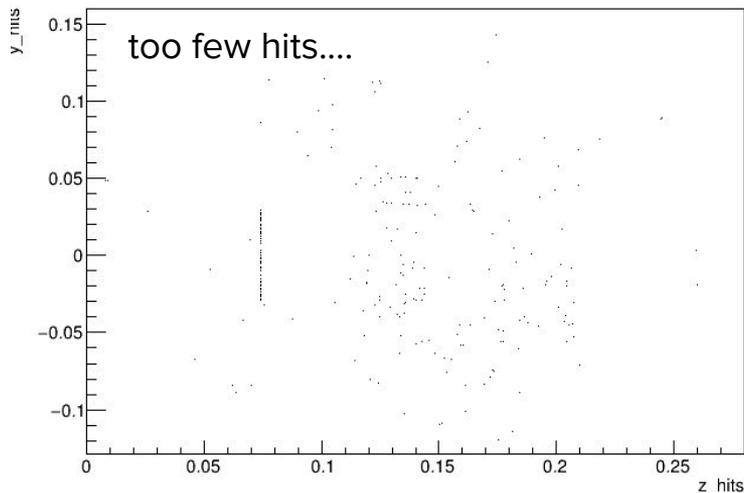
CYGNO simulation & analysis meeting

Updated simulation of NR with GEANT4

- Cross sections for low energy ions
- CYGNOSTepMax class to set maximum step of geant via macro
- example macro for He NR
- generate recoils in $(y,z)=(0,0)$ direction $(0,1)$

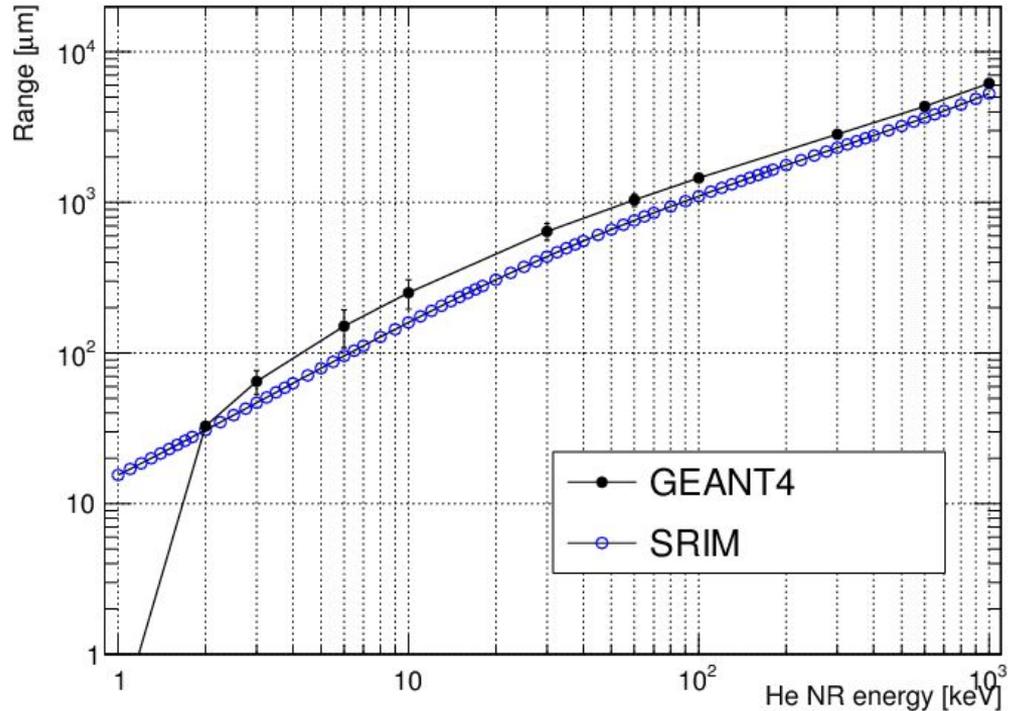
<https://github.com/CYGNUS-RD/CYGNO-MC>

forced to a maximum step of 1 μm via macro
`/CYGNO/stepmax 1 um`



Comparison with SRIM

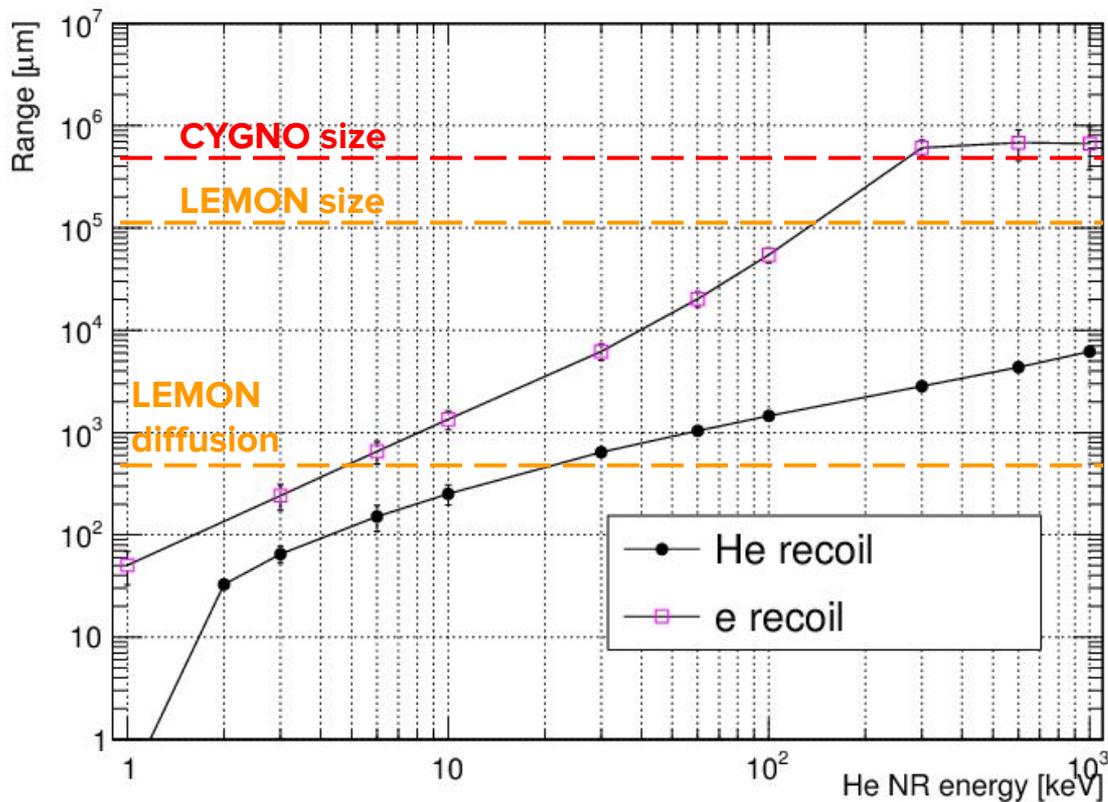
Range of He in 60:40 He:CF₄ gas mixture



In reasonable agreement
for $E \geq 2$ keV

(GEANT4 systematically
slightly higher range)

Nuclear vs electron recoils



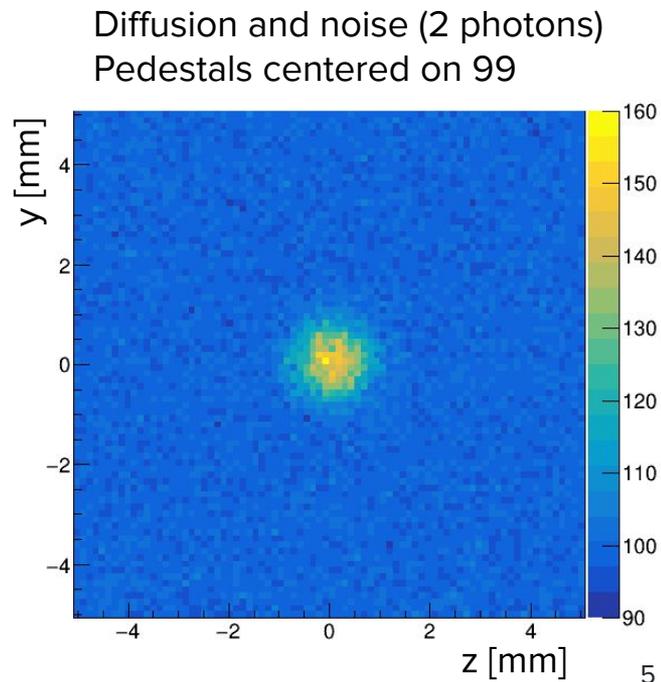
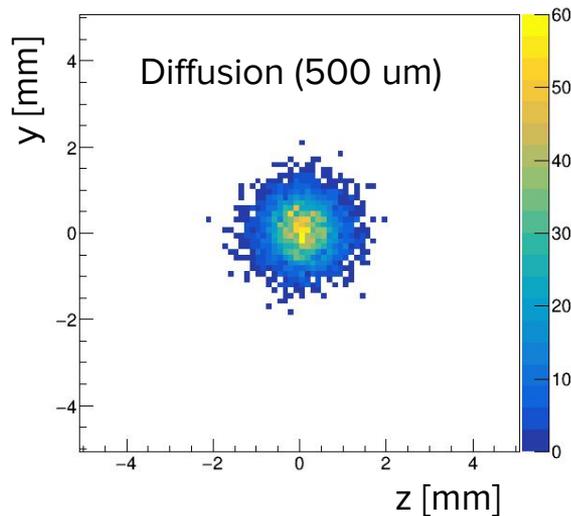
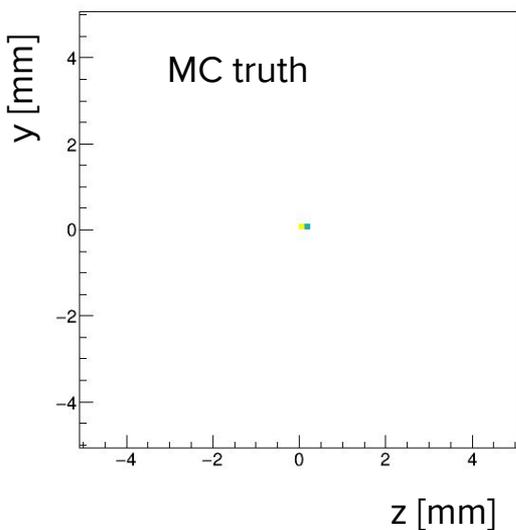
Limited by size of CYGNO detector
→ 50 cm since the recoil is generated in the center

Expect ER tracks not fully contained in LEMON from $E > 100$ keV

If diffusion ~ 500 μm (LEMON)
→ we should have some discrimination power for $E > 10$ keV

Digitization NR

- NR (He) of $E=10$ keV with GEANT4
- generated in $(y,z) = (0,0)$, direction $(0,1)$
- digitized with LEMON parameters



Digitization ER

- ER of $E=10$ keV with GEANT4
- generated in $(y,z) = (0,0)$, direction $(0,1)$
- digitized with LEMON parameters

